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ARS 877 (2012) (English): Carob -- Specification

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AFRICAN
STANDARD

CD-ARS
877

First Edition 2012

Draft African Standard to be cited as African Standard

Carob — Specification

Reference No. ARS 877:2012(E)
ICS 67.060

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Introduction

The carob is one of the most useful trees usually capable of growing in mild and dry places with poor soils. Carob pods have traditionally been used as animal and human food and currently the main use is the seed for gum extraction. The pods are used after crushing to separate seed and pulp.

The pulp can be ground into a fine powder for use in human nutrition. Carob powder consists of 46% sugar, 7% protein and small amounts of numerous minerals and vitamins and is thus quite nutritious. After oven-drying, the powder can be added to cakes, bread, sweets, ice creams or drinks as a flavouring. Carob powder 'cocoa' has advantages over chocolate in that it has fewer calories and neither caffeine nor theobromine.

Owing to the high sugar content of the pod and its relatively low cost, carob pulp was among the first horticultural crops used for the production of industrial alcohol by fermentation in several Mediterranean countries. In some countries, e.g. Egypt, carob syrup is a popular drink obtained by extracting carob kibbles with water. Single-cell organisms have been used to convert carob pulp into a high-protein feed; sugar solutions extracted from carob pods are an excellent substrate for culturing fungi such as *Aspergillus niger* and *Fusarium moniliforme* and the dried mycelium is a palatable and nutritious feed containing up to 38% crude protein by weight.

The possible use by the food industry of natural antioxidants contained on the carob seed coat as a by-product of the CBG industry recently has raised some interest.

The carob product most widely used, especially for the food industry, is the carob bean gum (CBG), or locust bean gum (LBG). This gum comes from the endosperm of the seed and chemically is a polysaccharide, a galactomannan. Carob gum is produced in various degrees of purity depending on how well the endosperm is separated from the embryo and seed coat. For use as a natural food additive, known as E 410, only high grade is admitted; for pet food more residues are allowed.

This mucilaginous gum, also known as 'tragasol', is used in a wide range of commercial products as a thickener, stabilizer, binder and gelling or dispersing agent. The food industry uses CBG for the production of a large number of different commodities: ice creams, soups, sauces, cheese, fruit pies, canned meats, confectionery, bakery products and pet foods. Technical applications of CBG include cosmetics, pharmaceuticals, film emulsions, paints, polishes, ceramics and adhesives.

Since it requires little if any cultivation, tolerates poor soils and is long-lived, carob tree is often recommended for reforestation of degraded coastal zones threatened by soil erosion and desertification and for planting as a windbreak around orchards.

This African Standard has been prepared to encourage the utilization of the carob tree and its products as a means of augmenting income generation from a resource that has multiple applications and is capable of being sustainably grown in many African countries. This African Standard sets uniform requirements for the carob pods and beans to facilitate trade.

Carob — Specification

1 Scope

This African Standard specifies requirements for carob, obtained from the carob tree (*Ceratonia siliqua* Linnaeus) for human consumption or forage, or for industrial use.

NOTE Carobs broken into pieces for industrial use, and seeded carobs, lie outside the scope of this African Standard.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ARS 53, *General principles of food hygiene — Code of practice*

ARS 56, *Prepackaged foods — Labelling*

AOAC Official Method 2001.04, *Determination of Fumonisins* B_1 *and* B_2 *in corn and corn flakes — Liquid chromatography with immunoaffinity column cleanup*

CODEX STAN 193, *Codex general standard for contaminants and toxins in food and feed*

CODEX STAN 234, *Recommended methods of analysis and sampling*

ISO 520, *Cereals and pulses — Determination of the mass of 1000 grains*

ISO 605*, Pulses — Determination of impurities, size, foreign odours, insects, and species and variety — Test methods*

ISO 2164, *Pulses — Determination of glycosidic hydrocyanic acid*

ISO 2171, *Cereals, pulses and by-products — Determination of ash yield by incineration*

ISO 5527, *Cereals — Vocabulary*

ISO 6322-1, *Storage of cereals and pulses — Part 1: General recommendations for the keeping of cereals*

ISO 6322-2, *Storage of cereals and pulses — Part 2: Practical recommendations*

ISO 6322-3, *Storage of cereals and pulses — Part 3: Control of attack by pests*

ISO 6639-1, *Cereals and pulses — Determination of hidden insect infestation — Part 1: General principles*

ISO 6639-2, *Cereals and pulses — Determination of hidden insect infestation — Part 2: Sampling*

ISO 6639-3, *Cereals and pulses — Determination of hidden insect infestation — Part 3: Reference method*

ISO 6639-4, *Cereals and pulses — Determination of hidden insect infestation — Part 4: Rapid methods*

ISO 6888-1, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of coagulase-positive staphylococci (Staphylococcus aureus and other species) — Part 1: Technique using Baird-Parker agar medium*

ISO 6888-2, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of coagulase-positive staphylococci (Staphylococcus aureus and other species) — Part 2: Technique using rabbit plasma fibrinogen agar medium*

ISO 6888-3, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of coagulase-positive staphylococci (Staphylococcus aureus and other species) — Part 3: Detection and MPN technique for low numbers*

ISO 7251, *Microbiology of food and animal feeding stuffs — Horizontal method for the detection and enumeration of presumptive Escherichia coli — Most probable number technique*

ISO 13690, *Cereals, pulses and milled products — Sampling of static batches*

ISO 16002, *Stored cereal grains and pulses — Guidance on the detection of infestation by live invertebrates by trapping*

ISO 16050, *Foodstuffs — Determination of aflatoxin* B_1*, and the total content of aflatoxin* B_1*,* B_2*,* G_1 *and* G_2 *in cereals, nuts and derived products — High performance liquid chromatographic method*

ISO/TS 16634-2, *Food products — Determination of the total nitrogen content by combustion according to the Dumas principle and calculation of the crude protein content — Part 2: Cereals, pulses and milled cereal products*

ISO 20483, *Cereals and pulses — Determination of the nitrogen content and calculation of the crude protein content — Kjeldahl method*

ISO 21527-2, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of yeasts and moulds — Part 2: Colony count technique in products with water activity less than or equal to 0.95*

ISO 24557, *Pulses — Determination of moisture content — Air-oven method*

3 Definitions

3.1 Definitions

For the purpose of this standard the following definitions apply.

3.1.1
pest-infested carobs
pods damaged by insect infestation and/or mites

3.1.2
rodent-damaged carobs
pods damaged by rodents

3.1.3
spoiled carobs
rotten, mouldy, sun-scalded, overly shrivelled and dried and stained pods. Light discoloration on some parts of the fruit and especially near the stem does not count as a defect.

3.1.4
broken carobs
incomplete pods of length greater than 3 cm of which parts are absent or separated. Carobs of which small parts near the stem are missing do not count as broken fruit.

3.1.5
undeveloped carobs
pods longer than 3 cm but smaller than 5 cm, which are shrivelled and misshapen

3.2 Description

Carobs are the ripe, dry pods of *Ceratonia siliqua* Linnaeus. The fruits of the carob tree (pods) shall be sound, clean and well developed and dried. They shall have the characteristic shape and shall be at least 5 cm long.

4 Requirements

4.1 Odour and taste

Carobs shall have an odour and taste characteristic of the fruit. They shall be free from foreign odour and taste, particularly rancidity.

4.2 Freedom from living insects and other pests

Carobs shall be free from living insects and/or any other living animal pest.

4.3 Spoiled carobs

The proportion of spoiled carobs, including pest-infested and rodent-damaged fruits, shall not exceed the value given in the table.

4.4 Broken carobs

The proportion of broken carobs shall not exceed the value given in Table 1.

4.5 Undeveloped carobs

The proportion of undeveloped carobs shall not exceed the value given in Table 1.

4.6 Extraneous matter

The proportion of extraneous matter such as dirt, stones, stem, leaf and other foreign matter shall not exceed the value given in Table 1.

Whole pods or broken pods smaller than 3 cm are counted as extraneous matter.

4.7 Moisture content

The moisture content of carobs shall not exceed 12 % (m/m).

Table 1 — Requirements for carobs

Characteristic	Requirement
Spoiled carobs other than mouldy and rotten carobs, but including pest-infected and rodent-damaged fruits, % (m/m) max	9.5
Mouldy and rotten carobs, % (m/m) max	0.5
Broken carobs, % (m/m) max	25.0
Underdeveloped carobs, % (m/m) max	3.0
Extraneous matter, % (m/m) max	1.0

4.8 Classification

Carobs shall not be subject to grading or classification.

4.9 Sampling

Methods of sampling and analysis shall be in accordance with CODEX STAN 234.

4.10 Methods of test

Samples of carobs shall be tested for conformity of the product to the requirements of the table by the method of test specified in Annex A. The moisture content (4.7) shall be determined in accordance with Annex B.

5 Provisions concerning sizing

The fruits of the carob tree (pods) shall have the characteristic shape and shall be at least 5 cm long.

6 Provisions concerning tolerances

Tolerances in respect of quality and size shall be allowed in each package and shall be in accordance with the limits indicated in Table 1.

7 Provisions concerning presentation

7.1 Uniformity

The contents of each package must be uniform and contain only carobs of the same origin and quality.

The visible part of the contents of the package must be representative of the entire contents.

7.2 Packaging

Carobs shall be packed in such a way as to protect the produce properly. Carobs may be dispatched in packages or without packages (in bulk).

The materials used inside the package must be new, clean and of a quality such as to avoid causing any external or internal damage to the produce. The use of materials, particularly of paper or stamps bearing trade specifications is allowed provided the printing and labelling has been done with non-toxic ink or glue.

In any case the mass of the containers shall not be more than 50 kg.

In bulk carriage, the wagons, lorries, trucks or holds of ships loaded with carob shall be clean and free from leaves, stalks or other foreign matter and foreign odours which may affect the product.

7.3 Presentation

Carobs may be presented:

- in small packages
- in small open baskets
- in trays.

8 Contaminants

8.1 Heavy metals

Carobs shall be free from heavy metals in amounts which may represent a hazard to health. If present, they shall not exceed the limits established in Table 2.

Table 2 — Heavy metal contaminant limits

Parameter		Limit	Test method
i)	Arsenic (As), ppm max.	0.10	CODEX STAN 234
ii)	Copper (Cu), ppm max.	5.0	
iii)	Lead (Pb), ppm max.	0.20	
iv)	Cadmium (Cd), ppm max.	0.02	
v)	Mercury (Hg), ppm max.	0.01	

8.2 Pesticide residues

Carobs shall comply with those maximum pesticide residue limits established by the Codex Alimentarius Commission for this commodity.

8.3 Mycotoxin and chemical limits

8.3.1 Carobs shall comply with those maximum mycotoxin limits established by the Codex Alimentarius Commission for this commodity.

8.3.2 Total aflatoxin levels in carobs for human consumption shall not exceed 10 ppb with B_1 not exceeding 5 ppb when tested according to ISO 16050.

9 Hygiene

9.1 It is recommended that the produce covered by the provisions of this Standard be prepared and handled in accordance with the appropriate sections of ARS 53, ISO 22000, and other relevant Codex texts such as Codes of Hygienic Practice and Codes of Practice.

9.2 The produce should comply with any microbiological criteria established in accordance with CAC/GL 21.

9.3 To the extent possible in good manufacturing practice, the products shall be free from objectionable mater.

9.4 When tested by appropriate standards of sampling and examination listed in Clause 2, the products:

- shall be free from microorganisms in amounts which may represent a hazard to health and shall not exceed the limits stipulated in Table 3;
- shall be free from parasites which may represent a hazard to health; and
- shall not contain any substance originating from microorganisms in amounts which may represent a hazard to health.

Table 3 — Microbiological limits for carob beans

	Type of micro-organism	Limits	Test method
i)	Yeasts and moulds, max. per g	10^5	ISO 21527-2
ii)	*Staphylococcus aureus* per 25 g	Not detectable	ISO 6888
iii)	*E. Coli*, max. per g	Not detectable	ISO 7251
iv)	*Salmonella,* max. per 25 g	Not detectable	ISO 6579

10 Marking or labelling

10.1 In addition to the requirements in ARS 56, each package shall be legibly and indelibly marked with the following:

i) product name as "Carobs";

ii) the trade mark or brand name, if any;

iii) name, address and physical location of the manufacturer/ packer/importer;

iv) lot/batch/code number;

v) net weight, in grams or kilograms;

vi) the declaration "Food for Human Consumption'';

vii) storage instruction as "Store in a cool dry place away from any contaminants'';

viii) crop year;

ix) packing date;

x) expiry date or best before ___________month ______year;

xi) a declaration of the product lifespan;

xii) instructions on disposal of used package;

xiii) country of origin;

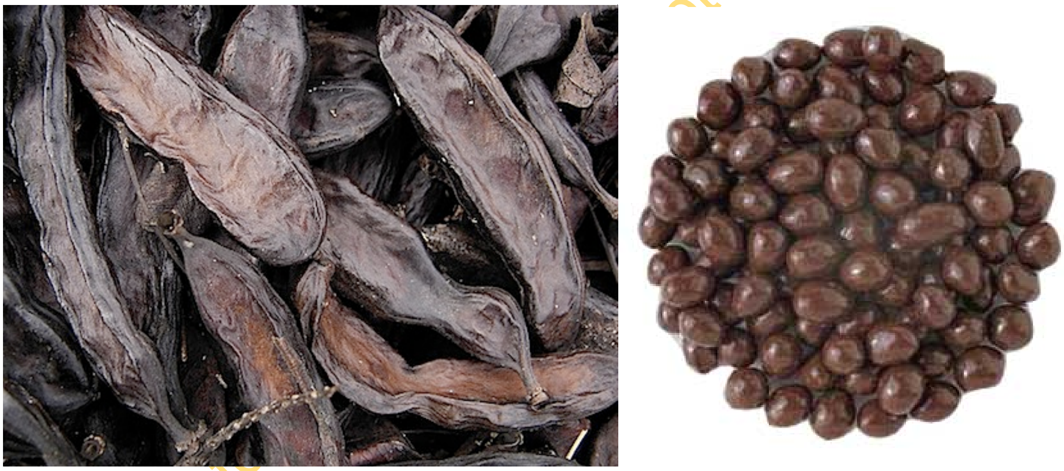
xiv) a declaration on genetic modification status.

10.2 The authorized packer shall observe all instructions regarding testing, grading, packing, marking, sealing and maintenance of records applicable to the product.

Carob pods on branch

Carob tree

Carob trees with pods



Dry carob pods and seeds

Carob flowering and mature green carob pods

Annex A
(normative)

Determination of spoiled carobs, broken carobs, undeveloped carobs and extraneous matter

A.1 Principle

Visual inspection of a test portion of carobs and physical separation of spoiled carobs, broken carobs, undeveloped carobs and extraneous matter.

A.2 Procedure

Weigh, to the nearest 0.1 g, a test portion of about 500 g. Separate the spoiled carobs, broken carobs, undeveloped carobs and extraneous matter carefully by hand or using tweezers. Separate mouldy and rotten pods from the other kinds of spoiled carobs.

Weigh each category separately to the nearest 0.1 g.

A.3 Expression of results

The content, expressed as a percentage by mass, of each category is equal to

$$\frac{m_1}{m_0} \times 100$$

Where

m_0 is the mass, in grams, of the test portion

m_1 is the mass, in grams, of the relevant category (see A.2)

Annex B
(normative)

Determination of moisture content (Routine method)

B.1 Definition

moisture content of carob
conventionally, the loss in mass determined under the operating conditions specified in this annex

B.2 Principle

Heating and drying of a test portion of carobs at a temperature of 103 ± 2 °C. Weighing, and determination of the loss in mass.

B.3 Apparatus

Usual laboratory equipment and in particular:

B.3.1 Electric oven, having effective ventilation and capable of being maintained at 103 ± 2 °C.

B.3.2 Dish with lid, of corrosion-resistant metal or of glass, with at least 50 cm^2 effective surface (for example minimum diameter 80 mm) and 35 to 40 mm deep.

B.3.3 Mortar and pestle, which permit the pods to be crushed without heating.

B.3.4 Desiccator, containing an effective desiccant.

B.4 Procedure

B.4.1 Preparation of test sample

Take approximately 100 g of carobs from the laboratory sample and crush them in a mortar (B.3.3) for 2 min, so that the greatest dimension of the particles does not exceed about 10 mm, while avoiding the formation of a paste.

B.4.2 Preparation of the dish and lid

Dry the dish and lid for 2 h in the oven maintained at 103 ± 2 °C. Leave to cool in the desiccator and weigh to the nearest 0.01 g.

B.4.3 Test Portion

Quickly place a test Portion comprising approximately half of the test sample (B.4.1) in the dish (B.4.2). Cover the dish with its lid and weigh to the nearest 0.01 g.

B.4.4 Determination

Place the dish containing the test portion (B.4.3) in the oven (B.3.1) at 103 ± 2 °C, on its lid. Keep it there for 6 h. Do not open the oven during this period. At the end of this period, remove the dish, cover it immediately with its lid and place it in the desiccator (B.3.4). After cooling to ambient temperature (approximately 40 to 60 min after placing in the desiccator), weigh it, still covered, to the nearest 0.01 g.

B.4.5 Number of determinations

Carry out two determinations.

B.5 Note on procedure

The crushing and weighing operations for each determination shall be carried out as rapidly as possible, and in any event within 5 min.

B.6 Expression of results

The moisture content, expressed as a percentage by mass, is equal to

$$\frac{m_3 - m_4}{m_3 - m_2} \times 100$$

where

m_2 is the mass, in grams, of the empty dish and its lid;

m_3 is the mass, in grams, of the dish and its lid with the test portion before oven drying;

m_4 is the mass, in grams, of the dish and its lid with the test portion after oven drying.

Take as the result the arithmetic mean of the two determinations; give the result to one decimal place.

B.7 Test report

The test report shall show the method used and the results obtained. It shall also mention any operating details not specified in this annex, or regarded as optional, together with details of any incidents likely to have influenced the results.

The test report shall include all the information necessary for the complete identification of the sample.

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ISO 7907:1987, *Carob — Specification*

CODEX STAN 193:1995 (Rev.4:2009), *General Standard for Contaminants and Toxins in Foods*

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